

Read my teeth: the history of dentistry in Moscow Theological Academy (Russia)

• Irina K. Reshetova •

PhD, scientific researcher, Department of Physical Anthropology, Institute of Archeology of Russian Academy of Sciences (IA RAS), Moscow, Russia

Address for correspondence:

Department of Physical Anthropology,
Institute of Archaeology of Russian Academy of Sciences,
Dm. Ulyanova, 19, Moscow, 117036, Russia
E-mail: reshetovairina@yandex.ru

Bull Int Assoc Paleodont. 2016;10(1):21-30.

Abstract

In 2014, the Institute of Archeology of the Russian Academy of Sciences conducted a comprehensive archaeological survey of the extraordinary necropolis of the Moscow Theological Academy. Before the First World War in this cemetery were buried teachers, professors and eminent students of this prestigious educational institution.

Multiple pathological conditions, as well as special cases of the treatment have been observed in the assessment of the state of dentition. A clear sign of a medical intervention has a rather rare phenomenon for archaeological artifacts. As a therapeutic method of treatment of caries dentists have used a variety of filling materials. There were cases of use of dental phosphate cement and amalgam. On the materials presented as the newest (at the time) technique of treatment is amputation of the pulp with the imposition of antiseptic dressings, and the cases of prosthetics. Various dentoalveolar anomalies, methods and techniques of dental treatment and prosthetics that have been discovered, lead us into the area of the history of medicine. Thus paleodontology source is seen as a chronological marker. Objects dated to the late 19th century (up to 1892) have no trace of the intervention of a dentist. So the burials of individuals with traces of treatment (fillings, dentures, etc.) probably date to the early 20th century. Among them are the operations that can be applied only after the 20-ies of the 20th century.

Keywords: dental treatments; spectroscopy; paleoanthropology; Russia

Introduction

Moscow Theological Academy is a prestigious higher educational institution of the Russian Orthodox Church, training clergy, teachers, scholars, and officials. It was reorganized in 1814 and moved from Moscow to the Trinity Lavra of St. Sergius monastery in the town of Sergiyev Posad, Moscow Region. By long tradition on the territory of the Holy Trinity Sergius Lavra were buried prominent historical figures and their families. Beyond the walls of the Moscow Theological Academy began to form its own necropolis, which were buried teachers and successful students. In the Soviet era the Lavra and the Moscow Theological Academy were closed, this necropolis was destroyed, and the playground was built in this site. In 1946 Lavra was opened again and in 1948 Academy returned to their walls. In connection with the celebration of the 200th anniversary of the Moscow Theological Academy the necropolis was investigated. The main purpose was to determine its location, structure, planigraphy, the lifetime, the personification of the burials, especially burials Academy professors. In 2014, the Institute of Archeology of the Russian Academy of Sciences conducted a comprehensive archaeological survey of the extraordinary necropolis of the Moscow Theological Academy.

Materials and Methods

There were detected and investigated 37 graves (4). Burials were placed in three rows. In historical terms this necropolis was known only one row of graves (2). This made it difficult to identify the buried. Now it is impossible to rely on written sources that previously seemed to be reliable. There was the obvious question about the chronological differentiation identified graves. Archaeological work is not conducted according to standard protocol in this area. Due to the fact that the cemetery was located at the site of an educational institution and the Orthodox monastery of the exhumation and examination were carried out for one or two days on-site, in the field. After that, the remains of funeral were buried in the same place. Export of the remains was forbidden. In part, this has limited the use of anthropological techniques.

Results

On the bones of individuals from the necropolis of specific markers of infection were detected (meningeal reaction, the manifestation characteristic of the final stage of bacterial infection), non-specific reactions – periostitis on the skeletal bones and cranium. As can be seen from the diagram (Figure 1), dental caries was the bulk of the pathologies of the oral cavity. In almost all cases, tooth decay was accompanied by inflammation (abscesses). In two cases, complications of caries were observed as an odontogenic osteomyelitis involving nearby lying tissues and spread the infection to the maxillary sinus. In the first case (the object 37), Figure 2, infection has occurred through the first molar of the lower jaw, the other (the object 32), Figure 3, location cannot be set, because all the molars of the upper and lower jaw in place lesions are lost in life. Non-carious lesions of dental hard tissues were also found, including: enamel hypoplasia, dental calculus (deposits of varying intensity), and change in color of enamel due to tobacco smoking (Figure 4). This situation continued until the widespread use of methods of preventive dentistry. Number of cases of dental caries has declined slightly, but the complications of this process are less common.

Clear signs of a medical intervention have a rather rare phenomenon for archaeological artifacts. The various sealing materials have been used as a therapeutic method of treatment of caries.

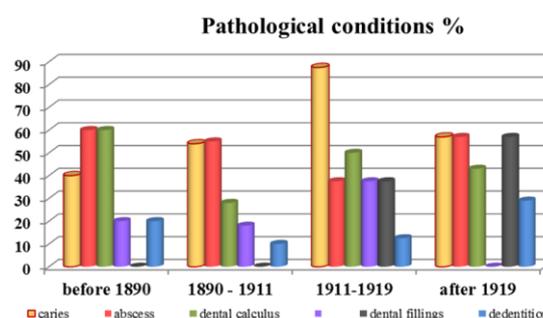


Figure 1 Diagram. Dental pathological conditions in the Moscow Theological Academy series.



Figure 2 Object 37. Male, 50 ±. Odontogenic osteomyelitis in far-advanced stage. There have been affected by the surrounding tissue, and maxillary sinus was infected. (Photo by Irina Reshetova)



Figure 4 Object 36. Male, 30-35. Change in color of enamel due to tobacco smoking. (Photo by Irina Reshetova)



Figure 3 Object 32. Male, 30-35. (Photo by Irina Reshetova)

The legend:

- *dental filling (*am – amalgam filling, *cem – cement filling)
- ** denture
- dst – diastema
- ch – chipping
- c – caries
- a – abscess
- rot– rotation
- dc – dental calculus
- leh – enamel hypoplasia
- 7- tooth loss in vital
- 3? – tooth missing, it is impossible to observe a sign

Object 17.

Male, 35-45 years of age.
Dental characteristics

*	*		c								c	c, a	c, a	c, a	
			, a								, a				
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
					?								?	?	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
		c			dc	dc	dc	dc	dc	dc				*	*
														, c	, c

Dental calculus was observed only at the lingual surface of the teeth. This along with the presence seals, even in small cavities may indicate compliance with hygiene and timely readjustment of the oral cavity.



Figure 5a Dental filling - amalgam. (Photo by Irina Reshetova)



Figure 5b Dental filling - dental cement. (Photo by Irina Reshetova)

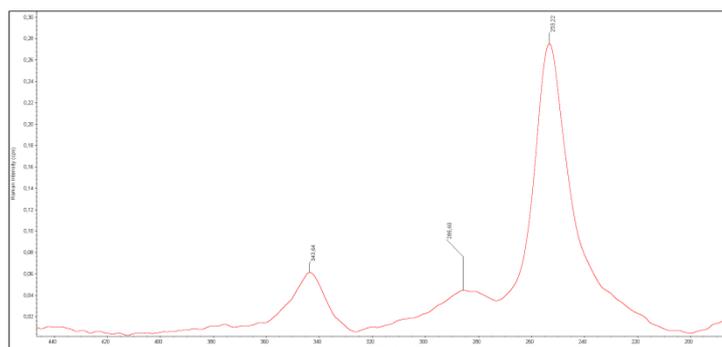


Figure 6a Object 82. Male, 30-40; a – Pulpitis treatment. (Photo by Irina Reshetova)

Figure 6b Object 82. Male, 30-40. Vermillion - mercury sulfide was used as an antiseptic composition pink color in the tooth cavity (Raman-spectroscopy¹) (Photo by Irina Reshetova)

¹ Micro spectrophotometer Raman «Nicolet Almega XR», Thermo Fisher Scientific, USA. Analyzed by O.U. Rusakova

Mass percent (%)																						
Spectrum	Al	Si	P	S	Cl	K	Ca	Ti	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ba	W	Au	Ag	Sn	Hg	
Object 82, cement filling	2,1	4,6		0,1	0,7	0,0		0,0		0,01				0,36	74,0	0,0						
	5	1	12,3	4	4	7	4,58	4		5	0,78				7	1						
	1,2	4,6	11,6	0	0,8	0,0	4,73	0		0,11	0,8			0,37	75,5	0,1						
	1	5	5		4	4									2	4						
	0,7	5,5	12,1	0,0	0,6	0,1		4,64	0,0		0,11	0,76			0,35	74,8	0,0					
	1	5	6	4	2	6			3							6	1					
	2,1	4,2	12,3	0,0	0,7	0,2		4,87	0,0		0,13	0,92			0,43	73,7	0,0					
	8	3	6	8	5				2							9	4					
	1,5	3,3	13,5	0,0	0,5				0,0		0,11	0,84			0,45	74,7	0,0					
	6	8	9	9	2	0,1	4,53	5								6	0					
	2,5	4,7	13,0	0	0,5	0,1	4,61	0		0,09	0,92				0,36	73	0,0					
	1	4	9		4				0							3	3					
4,6	5,1	11,9	0,0	0,5	0,2	4,49	0,0		0,12	0,86				0,33	71,5	0,0						
7	8	1	4	1	1			1							9	9						
2,5	4,6	13,1	0,2	0,5	0,3	4,71	0,0		0,11	0,81				0,33	72,4	0,0						
3	8	3	6	9			3								2	9						
Mean value	2,1	4,6	12,5	0,0	0,6	0,1	4,64	0,0		0,12	0,84			0,37	73,7	0,0						
	9	2	3	8	3	5		2							5	5						
Sigma	1,1	0,6		0,0	0,1	0,0	0,12	0,0		0,02	0,06			0,04	1,34	0,0						
	9	4	0,67	9	2	9		2							5	5						
Sigma mean	0,4	0,2	0,24	0,0	0,0	0,0	0,04	0,0		0,01	0,02			0,02	0,47	0,0						
	2	3		3	4	3		1							2	2						
Object 82, pink mass	0	0,2	0,06	0,4		0,0	10,4	0,0		0	0,16	0,0		0,29	83,2	0					4,91	
				7		9	5	8				7			3	0						
	0	0	0,2	1,6		0,0	10,5	0,0		0,05	0,24	0,0		0,28	82,3	0,0					4,51	
				8		3		4				7			8	4						
	1,6	0,5		1,5		0,1		0,0						0,26	80,4	0,0						
	2	2	0,74	2		2	10,2	4		0	0,23	0,1			3	4					4,17	
	0	0,0		0,4		0,0	11,2	0		0	0,2	0,0			1	0					4,61	
		2	0,59	8		6	5					6			0,32	82,4	0					
1,5	0,5		1,5		0,1	10,5	0		0,04	0,18	0,0			0,3	79,7	0,1					4,93	
6	4	0,35	8			4					4				4	1						
0,1	0,4		1,3		0,1	10,6	0,0		0,04	0,14	0,1			0,24	82,0	0,1					3,91	
8	5	0,55	7		2		2				2				8	8						
Mean value	0,5	0,2	0,41	1,1		0,0	10,5	0,0		0,02	0,19	0,0		0,28	81,7	0,0					4,51	
	6	9		8		9	9	3				8			1	6						
Sigma	0,8	0,2	0,26	0,5		0,0	0,35	0,0		0,02	0,04	0,0		0,03	1,33	0,0					0,41	
		5		6		4		3				3			7	7						
Sigma mean	0,3	0,1	0,1	0,2		0,0	0,14	0,0		0,01	0,02	0,0		0,01	0,54	0,0					0,17	
	3		0,1	3		2		1				1			3	3						
Object 37a, tooth 17, filling										0,09				4,01	0,44				23,8	12,7	58,8	
											0,09				4,11	0,54			5	8	4	
												0,04			4,27	0,48			18,9	15,4	60,8	
															3,98	0,46			1	9	5	
																			18,9	14,8	61,3	
Mean value										0,08				4,09	0,48			22,4	12,7	60,1		
																		4	3	7		
Sigma										0,02				0,13	0,05			4,4	3,49	1,15		
Sigma mean										0,01				0,07	0,02			2,2	1,75	0,58		
Object 37a, tooth 17, filling									0,14	0,03			0,0	3,65		0,2				3,42	92,4	
													0,1	3,57		0,3				7,11	88,7	
													0,0	3,46		0,3				17,4	78,6	
													0,0	3,82		0,3				4,08	91,5	
													0,0	2,65		0,2				47,0	49,8	
													0,0			5				4	5	
Mean value									0,09	0,07			0,0	3,43		0,3			15,8	80,2		
												7							1	2		
Sigma									0,03	0,03			0,0	0,46		0,0			18,3	17,8		
Sigma mean									0,01	0,01			0,0	0,02		0,0			8,2	7,98		
												2				2						
Object 82, tooth_38 filling										0,14	0,5			0,89	0,57					31,7	66,1	
																				7	7	
																				32,8	64,9	
																				9	1	
																				39,3	58,5	
Mean value																			1	5		
																			33,8	63,6		
Sigma																			8	4		
Sigma mean																			35,6	62,1		
																			1	2		

Object 32.

Male, 30-35 years of age.
Dental characteristics

				d	d	ch								a	a	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
	c			d	d	dc	dc	dc	dc	le	d			a	a	a
				c	c					h	c					

Deformation of the temporomandibular joint on the right side (compensatory reaction due to inflammation of the jaw on the left).

Object 36.

Male, 30-35 years of age
Dental characteristics

c	c					c	c					c		c		a
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
	c	c											c	c	c	

There is a discoloration of enamel crowns of teeth from the vestibular side.

Object 37.

Male, 50 ± years of age
Dental characteristics

a	c	a	a	c		c	ch	ch	ch		c	c				c
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
	c		c				c	c	c				a	c		a
							r	r	r							

There are moderate dental calculus with the lingual and buccal crown all of the dentition. There is an extensive periosteal reaction on the outer surface of the body and the alveolar processes of the lower jaw on the left (C₁ - M₃), on the palate is marked vascular reaction. In aggregate these features suggest a strong inflammation in the tissues of the jaw. Probably contributed to the complication of tooth decay is not only the lack of proper hygiene, but also weakened immunity.

Object 37a.

Male, 60± years of age
Dental characteristics

*																ch	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	*	
	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8		
	c,															c,	*
	**																

There weakly expressed dental calculus, which is probably indicative of the regular prevention of dental health along with the presence of seals.

Object 80.

Male, 25-30 years of age

Dental characteristics

	c			c	*	l	*	c	*	*	c			c	*	*
				,	a	e	c	,	c	c	,				a	a
				a	m	h	e	l	e	e	l					
				m			m	e	m	m	e					
							,	h	,	,	h					
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
	c			*		d	d	d	d	d				c	c	c
				a		c	c	c	c	c						
				m		l	l	l	l	l						
						e	e	e	e	e						

Object 81.

Male, 25-30 years of age

Dental characteristics

	c								*	l	r					
									e	e	o					
									h	h	t					
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
	c				*	l	d	d	d	d			r		*	
					a	l	d	d	d	d			o		a	
					l	e	c	c	c	c			t			
					e	h										
					h	,										
					d											
					c											

Object 82.

Male, 30-40 years of age

Dental characteristics

c			a			a				*		-	*c	-	*c	c
,						,				c			e		e	
a						*				m			,c		,a	c
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
	-	*		d	d	d	d	d	d	d	*					
	a		c	c	c	c	c	c	c	c						

Object 83.

Male, 30-40 years of age

Dental characteristics

c		c								c				c		
,		,												*c		
a		a								em				em		
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
c	*		*	*									a*	a		
*			*	*											*	
a																

We have found cases of dental phosphate cement and amalgam. Cases of multiple caries treatment (up to 8 seals at a time) were found: cement fillings are installed on visible areas of the front teeth, amalgam fillings – on the lateral surface (Figure 5).

Filling and composition of the preservative mass inside the tooth (the object 82), Figure 6, were analyzed by spectrometry. Figure 7 Vermillion – mercury sulfide was used as an antiseptic composition pink color in the tooth cavity. It probably was similar to the widespread use of mercury chloride – sublimate pasta. Resorcinol use regarded as a hypothesis about the composition of the substance. However, this version has not been confirmed.

In the first case, the prosthesis bridge had rigidly secured on the lower jaw premolars, (Figure 8). Gold has been used as a material for crowns prosthesis, and gold-copper alloy was used for fasteners – pin. Only based on indirect evidence can be judged on the second copy of the prosthesis. On the upper jaw male (Object 82) in place of the right central incisor tooth fragment is preserved (root only) with a pin on the inside of the prosthesis (Figure 9). Samples for X-ray fluorescence analysis were taken from the surface of the pin (at the junction with the crown (now lost)) and also

from the pin’s core. The data showed that the alloy of copper and gold has been the composition of the pin, while the crown composed of carbide material - tungsten and iron.

Discussion

In the late 19th – early 20th century has been greatly improved methods of preventive dentistry. Among these undeniable breakthroughs include the improvement of filling materials: the appearance of the amalgam - the material of the silver paste, and mercury, the use of different dental cements. The balanced composition of the amalgam was developed by G.V. Black in 1895 and was widely used in Russia until the 60th XX century. In 1858 the chemist Charles Sylvester Rostaing manufactured phosphate cement powder consisting of zinc oxide and phosphoric acid. This recipe has excellent properties – adhesion, low thermal conductivity, good chemical resistance (3). Such methods eliminate dental caries effects we have seen in the materials of the necropolis of the Moscow Theological Academy. However dental medicine was not available to the wider population as a social service.

For a long time, the sole aim of treatment is to termination acute pain attacks. To accomplish this have been suggested various physical methods (burning red-hot tools, broke off the crown) and chemical means of influencing the content of the tooth cavity (zinc chloride, creosote, lapis, and arsenic). In addition, the impact applied to gingiva: incisions (scarification), infriktion various medications (morphine, Veratrine, chloroform). Local intervention complemented by the appointment of general-purpose medicinal drugs (laxatives, salivary, and others.). Of the many old tools preserved in the modern arsenal just arsenic, this has been successfully used in the form of arsenious acid since 30-ies of the XX century. The objective impacts to infection were determined during the development of the doctrine of antiseptic and its application to dentistry. The principles of antiseptics (Joseph Lister, Adolf Witzel), which were introduced in conservative dentistry promoted the improvement of methods of treatment of pulpitis. The objectives of periodontal infection prevention, demands a radical elimination of infectious focus and neutralization of the tooth with pulpitis decided only recently in

connection with the study of problems of oral sepsis.

In 1874, Adolf Witzel proposed a method of partial removal (amputation) of the pulp with the imposition of antiseptic dressings with phenol and paste corrosive sublimate (mercuric chloride). In 1912 it was introduced the method of filling of infected teeth with a resorcinol formaldehyde paste. This method has come to Russia only in 1923-24. (1). This method has a feature – in addition to its high toxicity of resorcinol, stained teeth in pink. It is interesting that the dentures were made of costly and clean (with no contaminants) materials. This shows again a high status of the people buried in the necropolis.

Chemical analyzes of filling materials, and methods for treating tooth allowed going beyond the "just paleoanthropology." The obtained results allowed literally «reading by teeth» the story of the formation of this cemetery and creating some chronological scale in conditions of written sources unreliability.

Conclusion

Dentoalveolar anomalies, methods and techniques of treatment and prosthetics helped distribute burial in chronological order. Burial of individuals with traces of treatment (fillings, crowns, etc.) with high probability refer to the beginning of the twentieth century. Earlier burial successfully identified the written sources and methods of forensic medical examination. The remains, which date from the end of the XIX century, have no traces of dental intervention. In order to study chemical composition of fillings and dentures were used physico-chemical research methods. It is established use of dental prostheses made of cemented carbide materials (tungsten + iron), as well as carrying out operations of the partial pulpectomy with overlay antiseptic bandage. This brings us to the history of medicine. In the late XIX-early XX centuries dentistry in Russia was being formed. There have appeared professional education for physicians, dentists, and methods for therapeutic and surgical dentistry perfected every year. In the papers, sanctifies dental history in Russia in detail, describes these stages of development, and provides information about the materials used in the treatment. Thus odontology source can be very informative, not only for technological

issues but even in determining the burial history (as in this case).



Figure 8 Fixed dental restoration. The crown and bridge prosthesis in the mandibular premolars. (Photo by Irina Reshetova; close-up photo made by employees of the Moscow Museum of Modern Art (MMOMA))



Figure 9 Object 82. Male, 30-40. The right central maxillary incisor with the remnants of the dental pin. (Photo by Irina Reshetova)

Acknowledgments

Author would like gratitude to the head of the department of conservation of the archaeological heritage IA RAS Asya Engovatova and Helen Vasilyeva (IA RAS) for the provision of materials, as well as employees of the Laboratory of the Moscow Museum of Modern Art V. Semikin, I. Konova, O. Rusakova, L. Pelgunova for help with the analysis.

References

1. Gaukhman B.I. Grounds for rational formulation of the dental business // Journal of dentistry and stomatology. 1925; № 1;- pp 70-83. (on Russian)
2. Golubtsov S.A., protodiakon. Moscow Theological Academy. Building and economic activities of the Academy Board, 1870-1919 years. T. I. Part I. Moscow: Typescript; 1982. (on Russian)
3. Pashkov K.A. Teeth and Dentistry. Essays on History. Moscow: Veche; 2014; 240 p.
4. Reshetova I. K. Report on the anthropological examination of the remains of burials of the Moscow Theological Academy on the territory of the Holy Trinity St. Sergius Lavra in 2014. Moscow: IA RAS; 2015. (on Russian)